Update on Geostationary Littoral Imaging and Monitoring Radiometer

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https://eos.unh.edu/glimr

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GODDARD EARTH SCIENCES

Raytheon Intelligence & Space

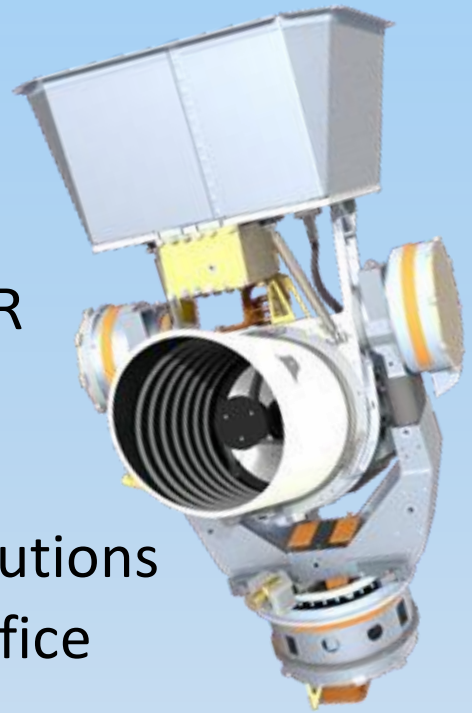
SwRI

What is GLIMR?

NASA's latest Ocean Color instrument:

Hyperspectral sensor in Geostationary orbit (98° W ± 10°)

- NASA's Earth Venture Instrument 5
- PI: Joe Salisbury (UNH)
- UNH: PI, management, systems engineering, science ops center, & INR
- Instrument by Raytheon; Safety mission assurance by SwRI
- GSFC: deputy PI, science data segment, and science
- Science & Applications team from various academic and federal institutions
- Mission management by Earth System Science Pathfinder Program Office



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Status and Schedule

• Project start:	17 May 2021
• KDP-C:	6 March 2023
• CDR:	20-23 June 2023
• Instrument delivery:	~January 2025
• Launch TBD:	~2027

A glimpse into GLIMR's capabilities

Hyperspectral UV-Vis-NIR

- 340-1040 nm
- <2 to <10 nm spectral resolution across UV-Vis
- <1 to <5 nm sampling UV-Vis

High Temporal

- ~hourly scans of Gulf of Mexico (6x/day)
- 2x to 3x/day other regions
- 3x/day HAB target sites

High Spatial

- 300 m nadir Ground Sample Distance (GSD)
- ~328 m Gulf of Mexico
- <500 m over coastal continental US

High SNR

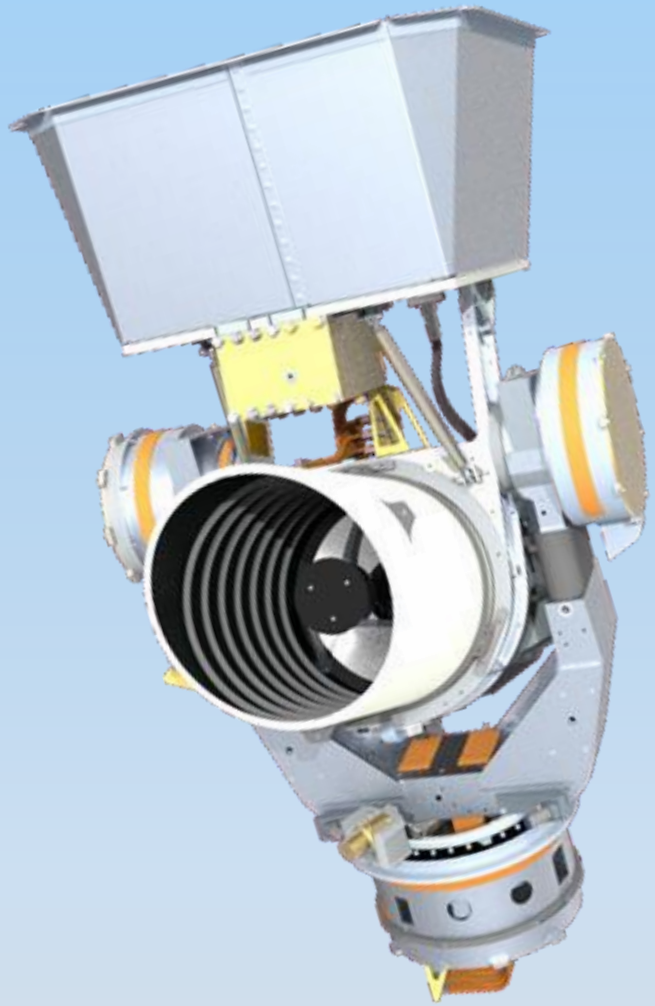
Requirements at Ocean Ltyp

360-380 nm: >420 *
380-415 nm: > 650
415-580 nm: > 1000
580-650 nm: > 750
650-880 nm: > 580 ^

Adaptive Scheduling & Targeting

- Flexibility to target episodic events & hazards

* Best effort <360 nm
^ SNR >=500 (700-720nm)



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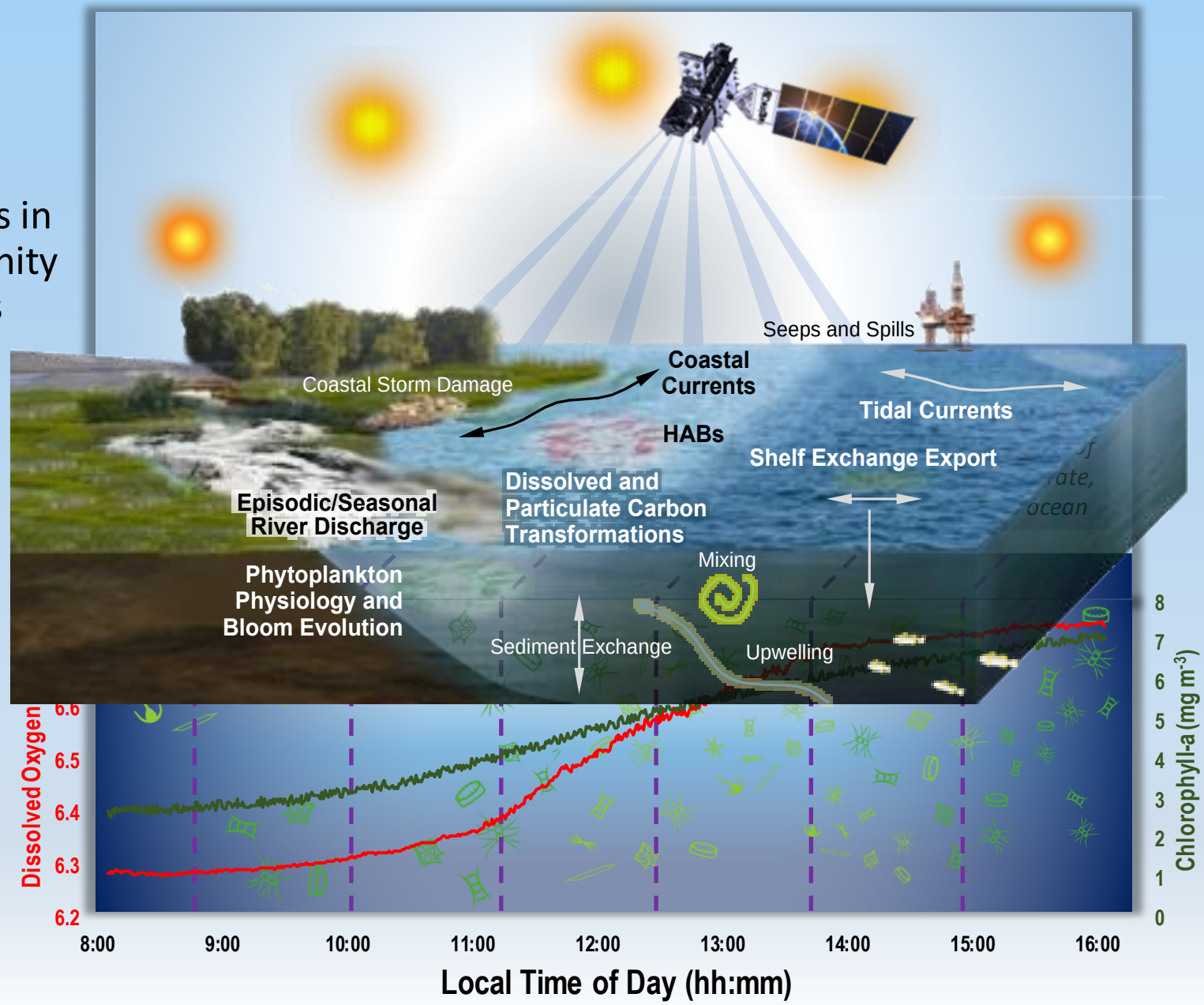
GLIMR's combined capabilities are unprecedented

GLIMR Science from Geo Vantage Point

- **Phytoplankton Growth and Physiology**
  - Observe, quantify, and understand processes associated with rapid changes in phytoplankton growth rate and community composition at their intrinsic timescales
- **Short Term Coastal Processes**
  - Quantify high frequency fluxes of sediments, organic matter, and other materials between and within coastal ecosystems and investigate how these regulate the productivity and health of coastal ecosystems.

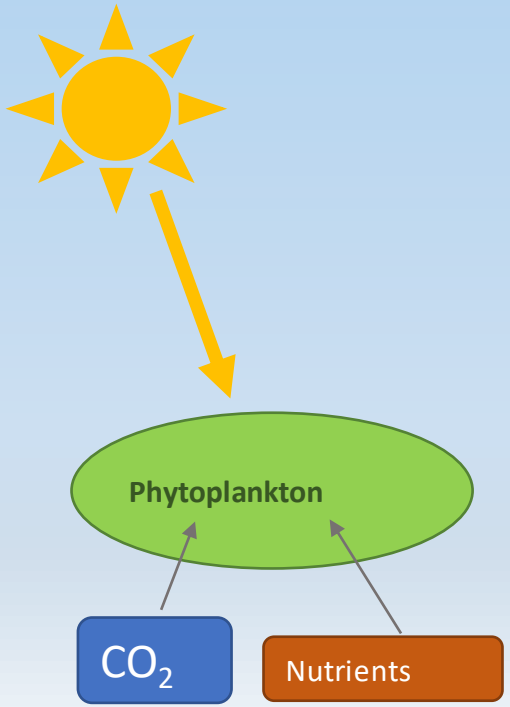
GLIMR will enable us to move beyond studying the *effects* of the process, and into the study of the processes themselves.

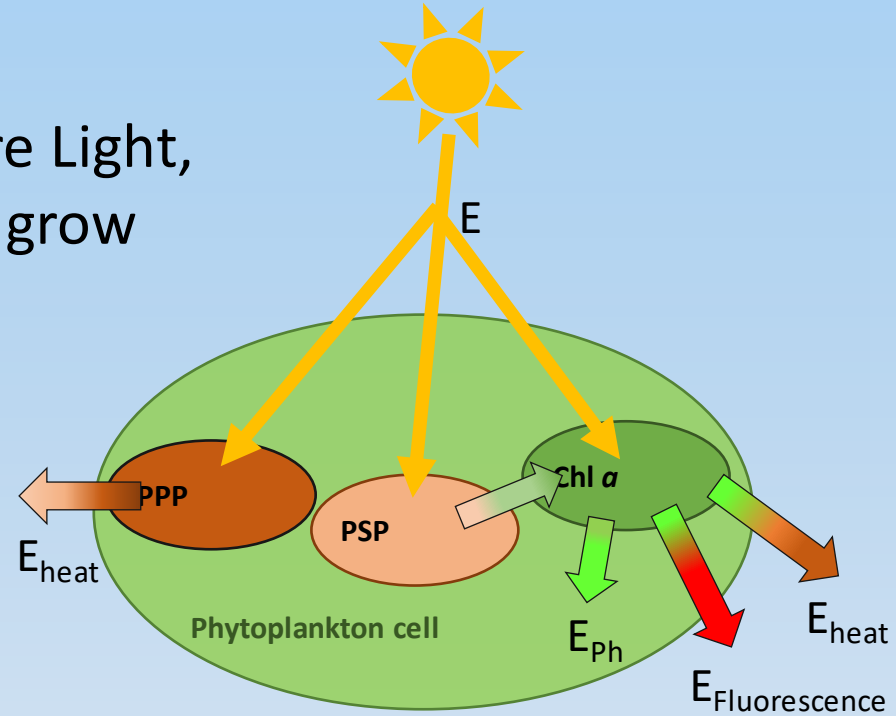


Phytoplankton Physiology and Blooms

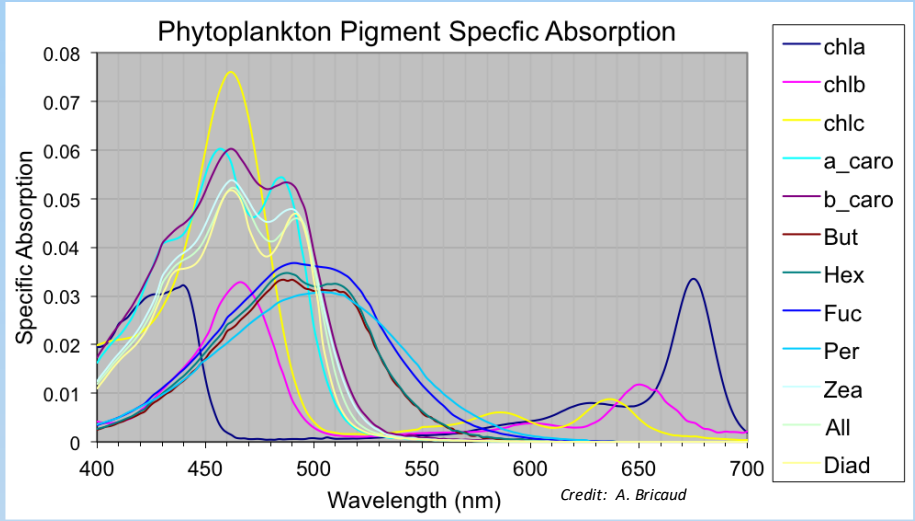
Amounts and quality of Light, CO_2 and Nutrients regulate physiology and growth

Fundamentally, phytoplankton require Light, CO_2 and Nutrients to grow

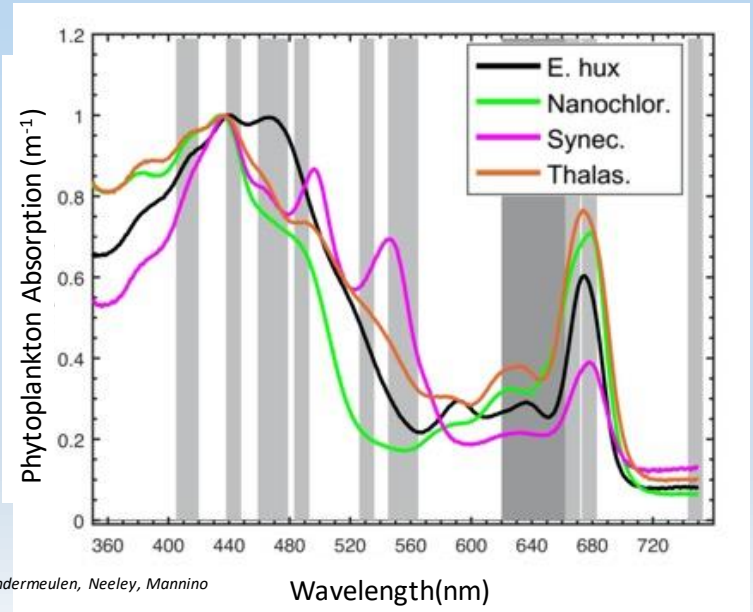




Credit design: Ostrowska et al. 2012



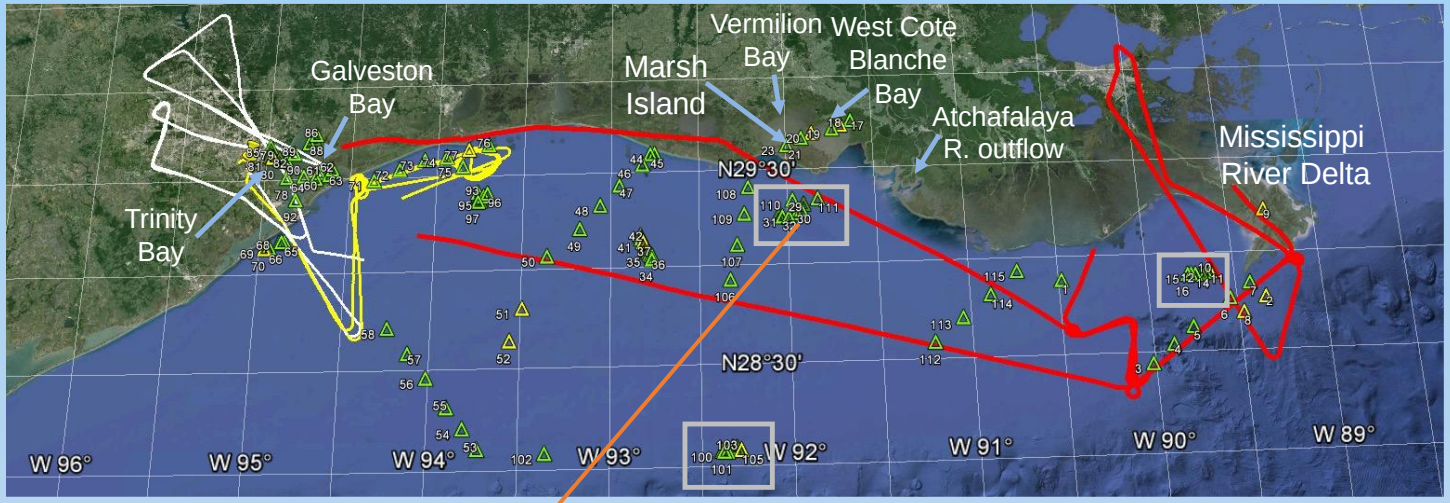
Credit: A. Bricaud

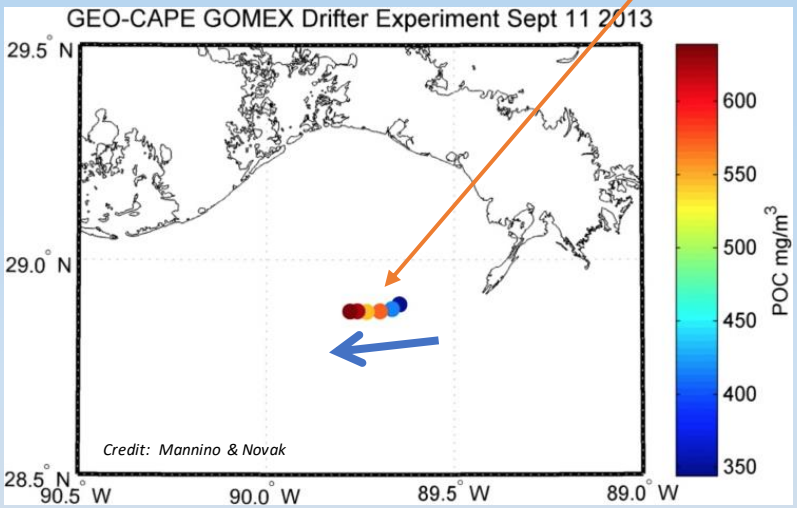


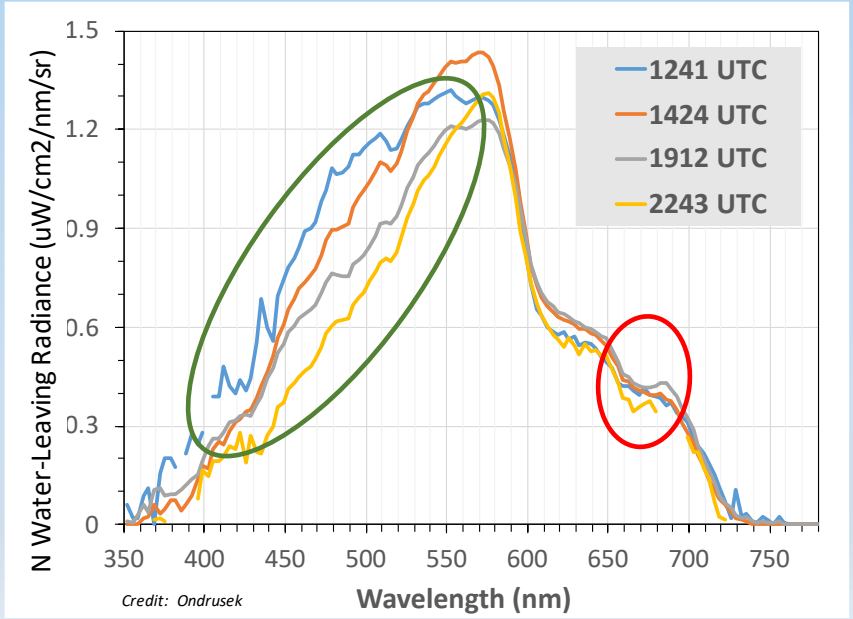
Credit: Vandermeulen, Neeley, Mannino

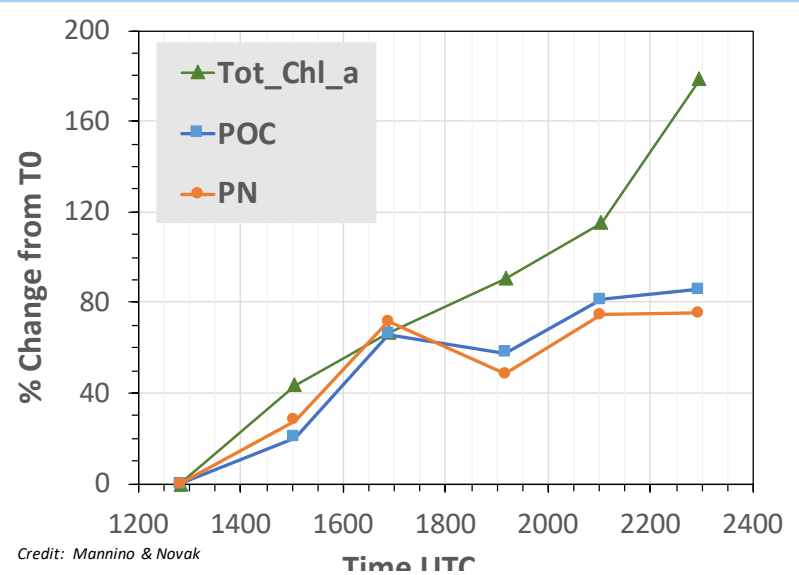
Manifested in pigment composition and their absorption spectra as well as variable fluorescence response

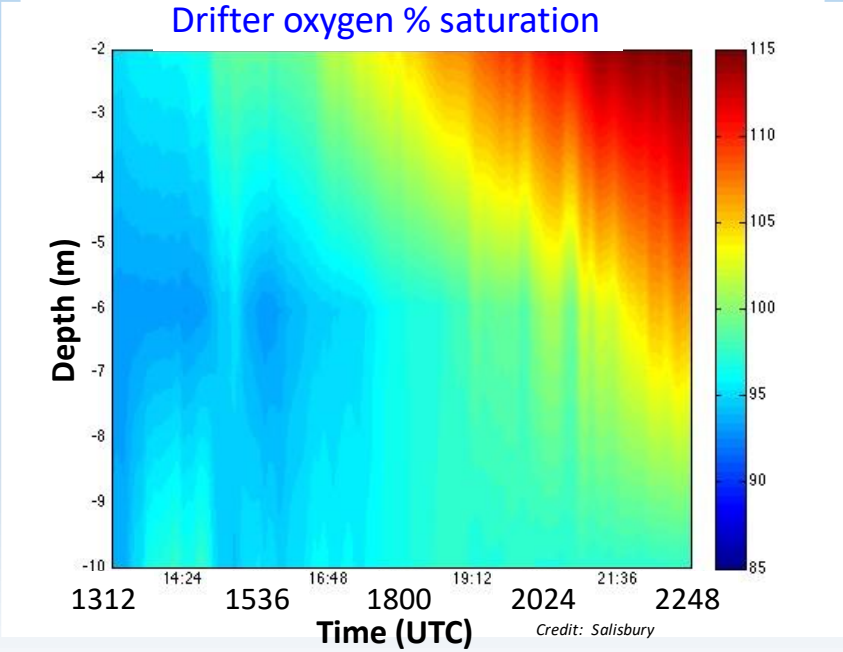
Phytoplankton and ecosystem diurnal response to light and nutrients







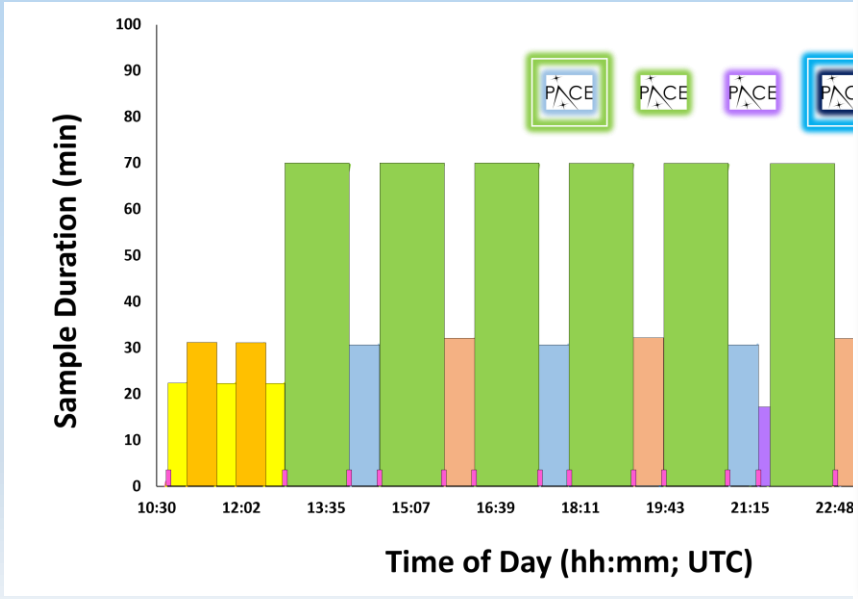


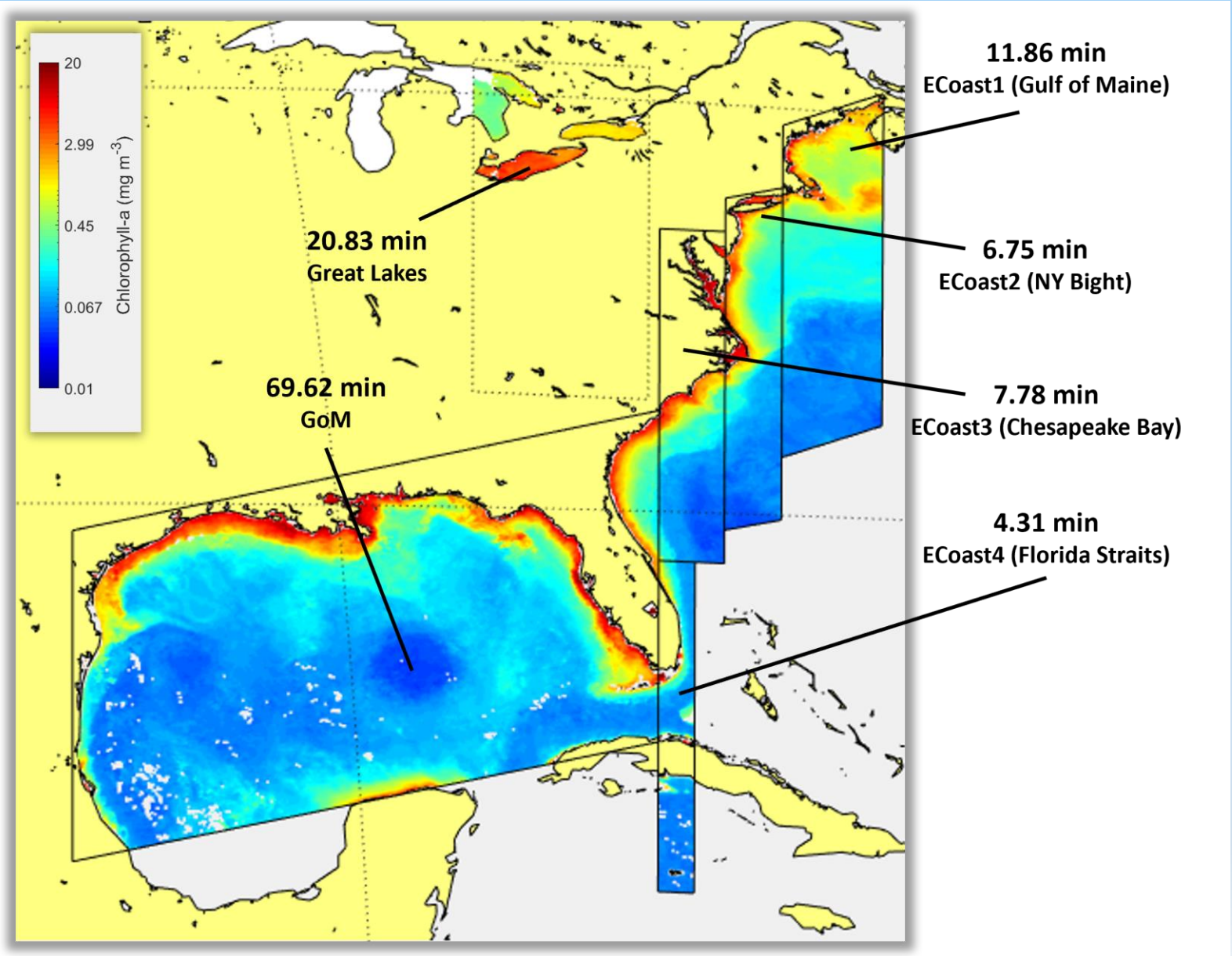


Diurnal productivity observable through change in L_{wn}, Chl-*a*, POC, *etc.*

Observing Regions & Daily Schedule

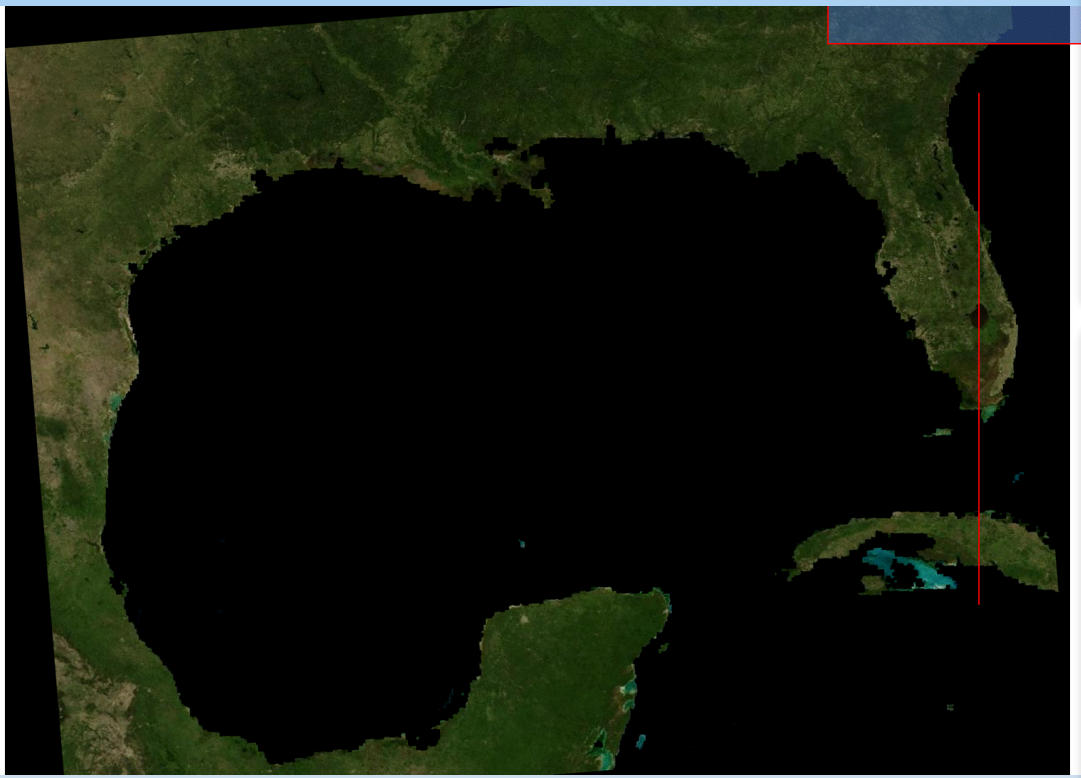
Baseline Regions	Freque
Gulf of Mexico	6x/ day
East & West CONUS coastal waters	2x/ day
Amazon River Plume region[3]	2x/ day
Caribbean Sea region of interest	2x/ day
Hawaii region of interest[3]	2x/ day
Other HAB target sites	3x/ day
Cross-calibration w/ other sensors	3x/ day
Invariant South Pacific clear waters	2x/ day

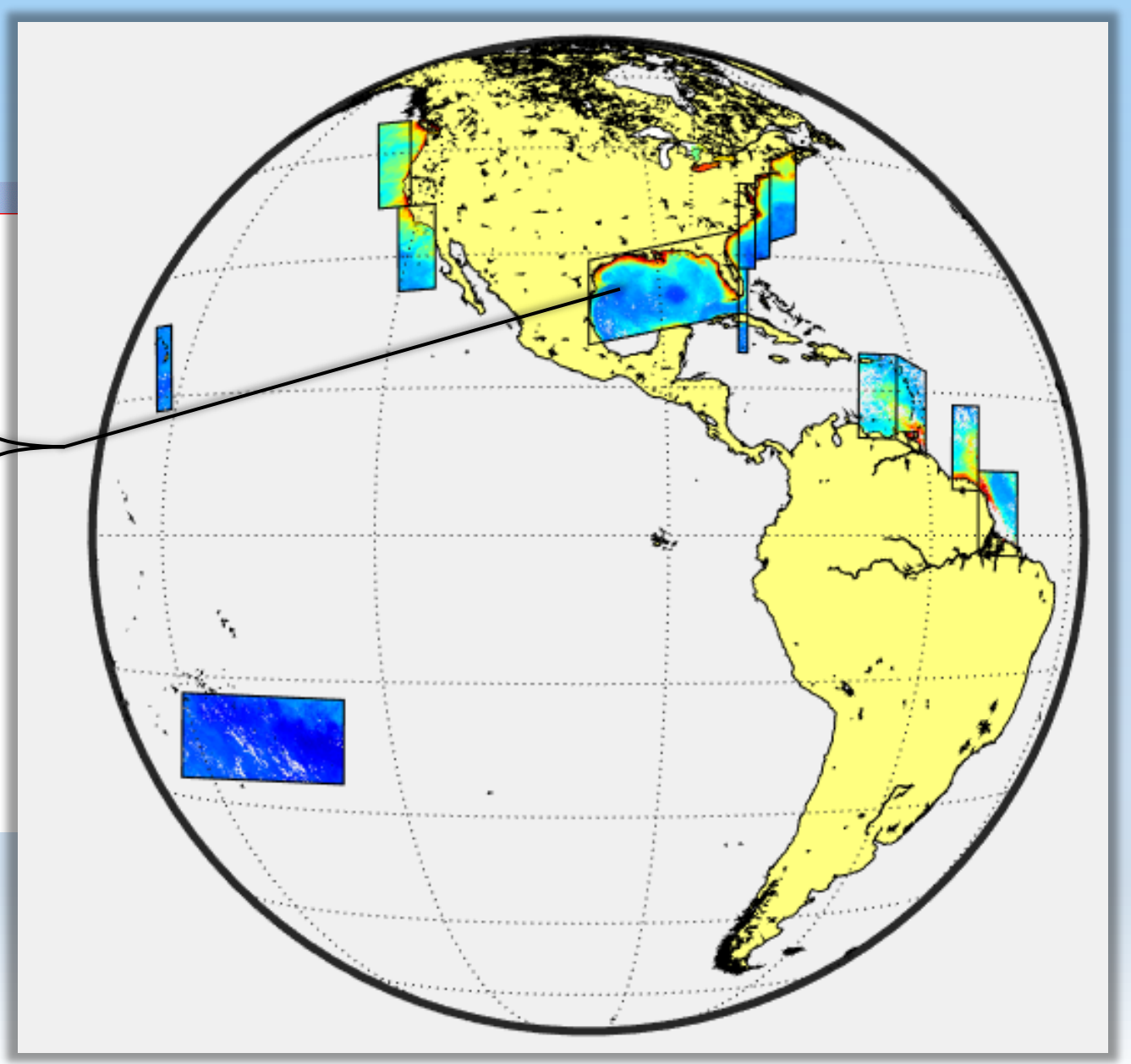




Star Look | GoM | CONUS East | Amazon | Caribbean | CONUS West | South Pacific | Hawaii | PACE_nadir

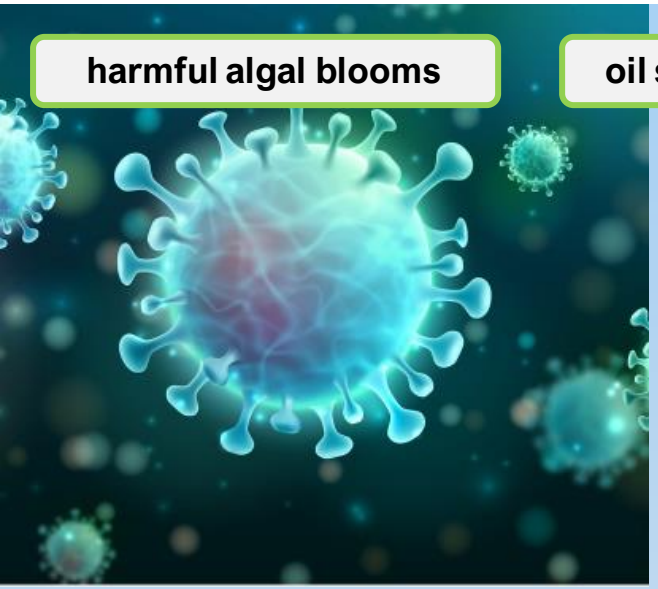
How GLIMR Images Primary Observing Regions





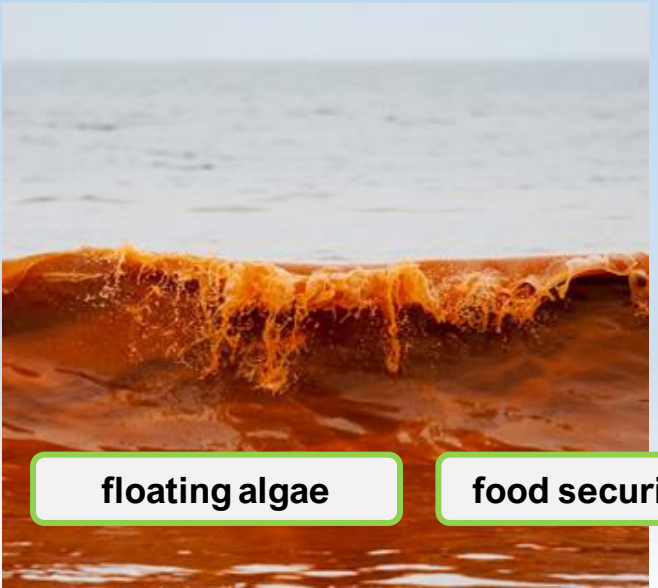
Applied Science Foci Areas

Targeting the **formation, magnitude, and trajectory** of coastal hazards, for **improved management & mitigation**



harmful algal blooms

oil spills



floating algae

food security

fisheries

water quality

pathogens

coastal management

conservation

surface currents

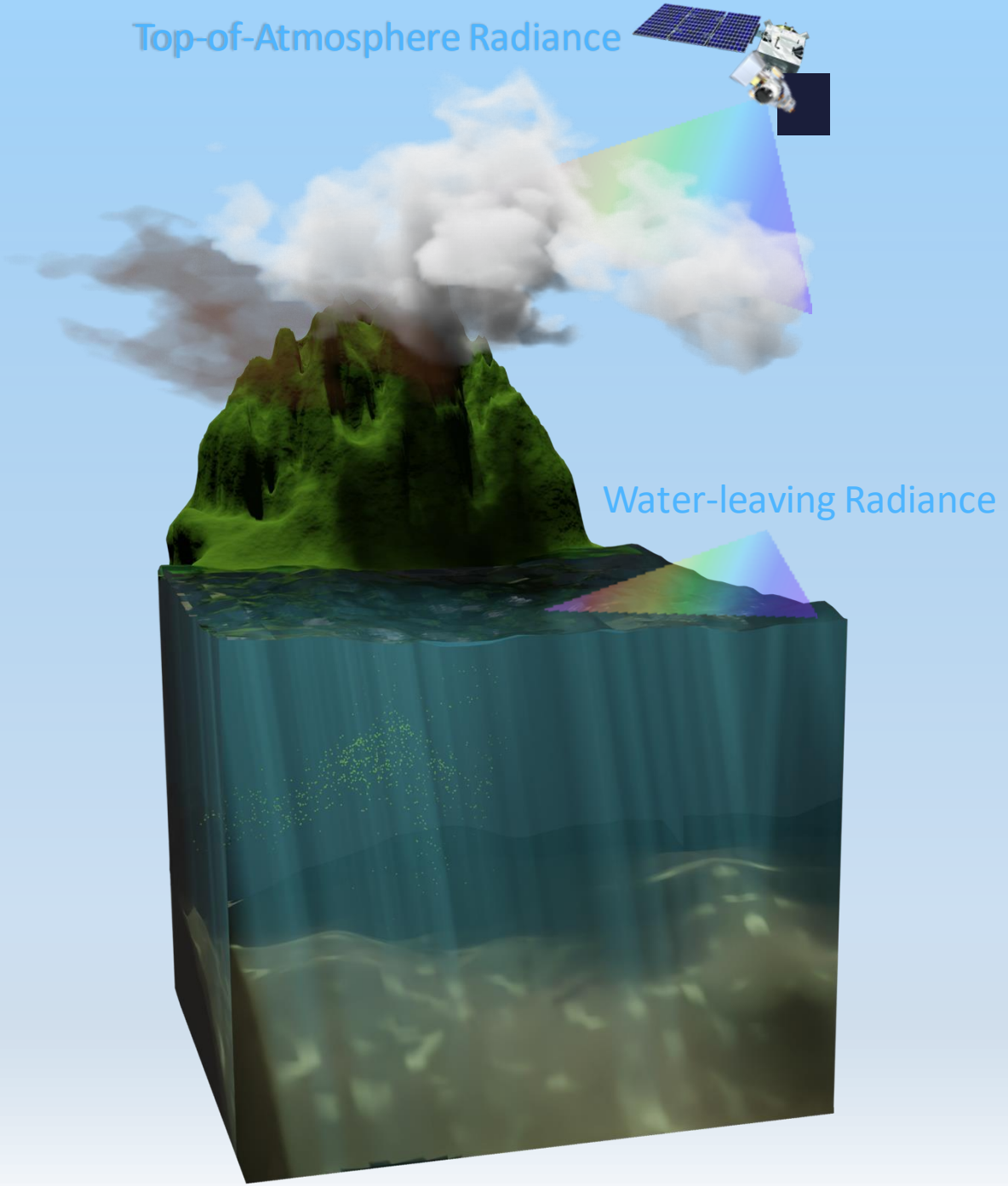
navigation

tourism

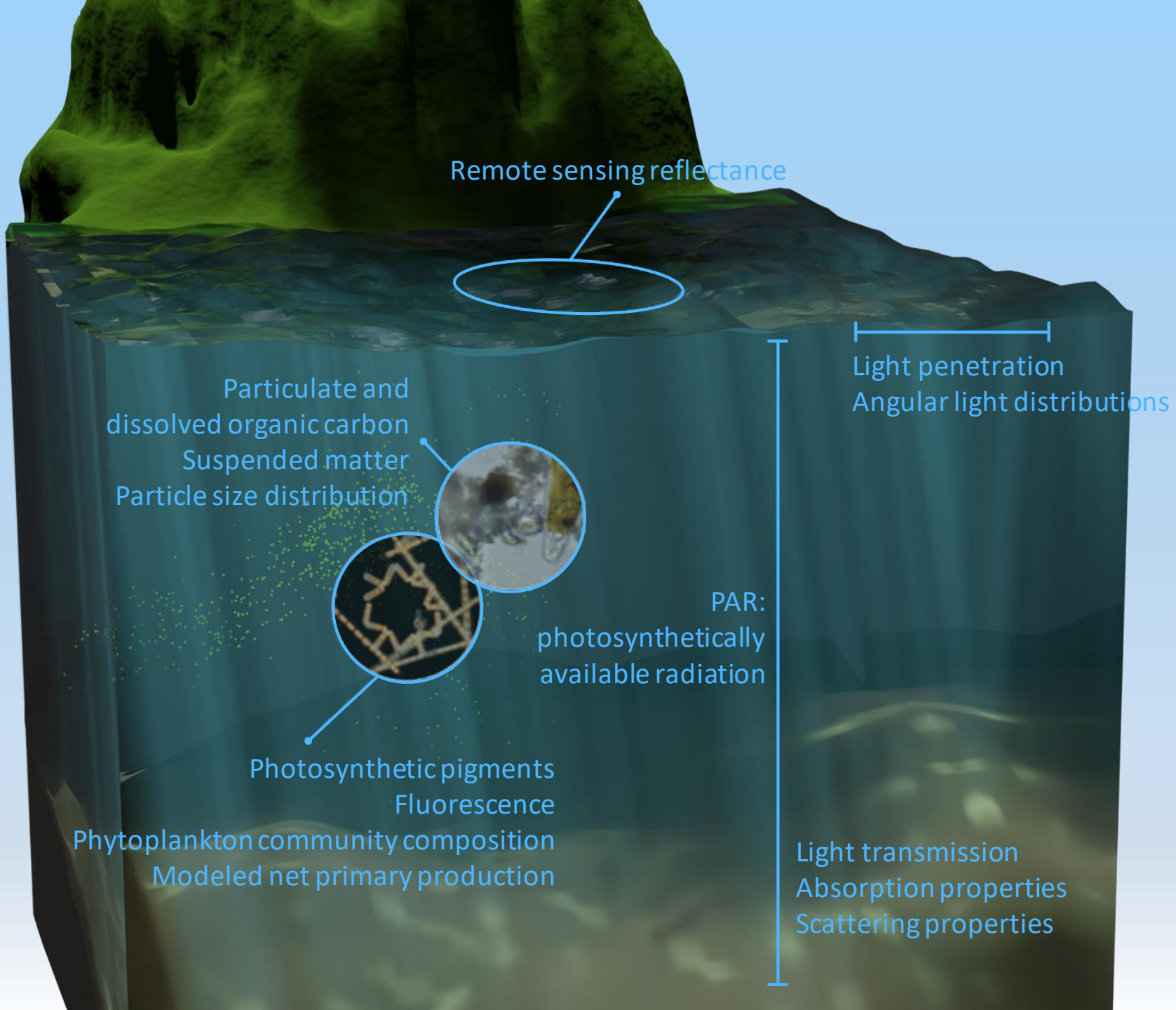
recreation

forecasting

GLIMR
PLANNED OCEAN COLOR DATA PRODUCTS

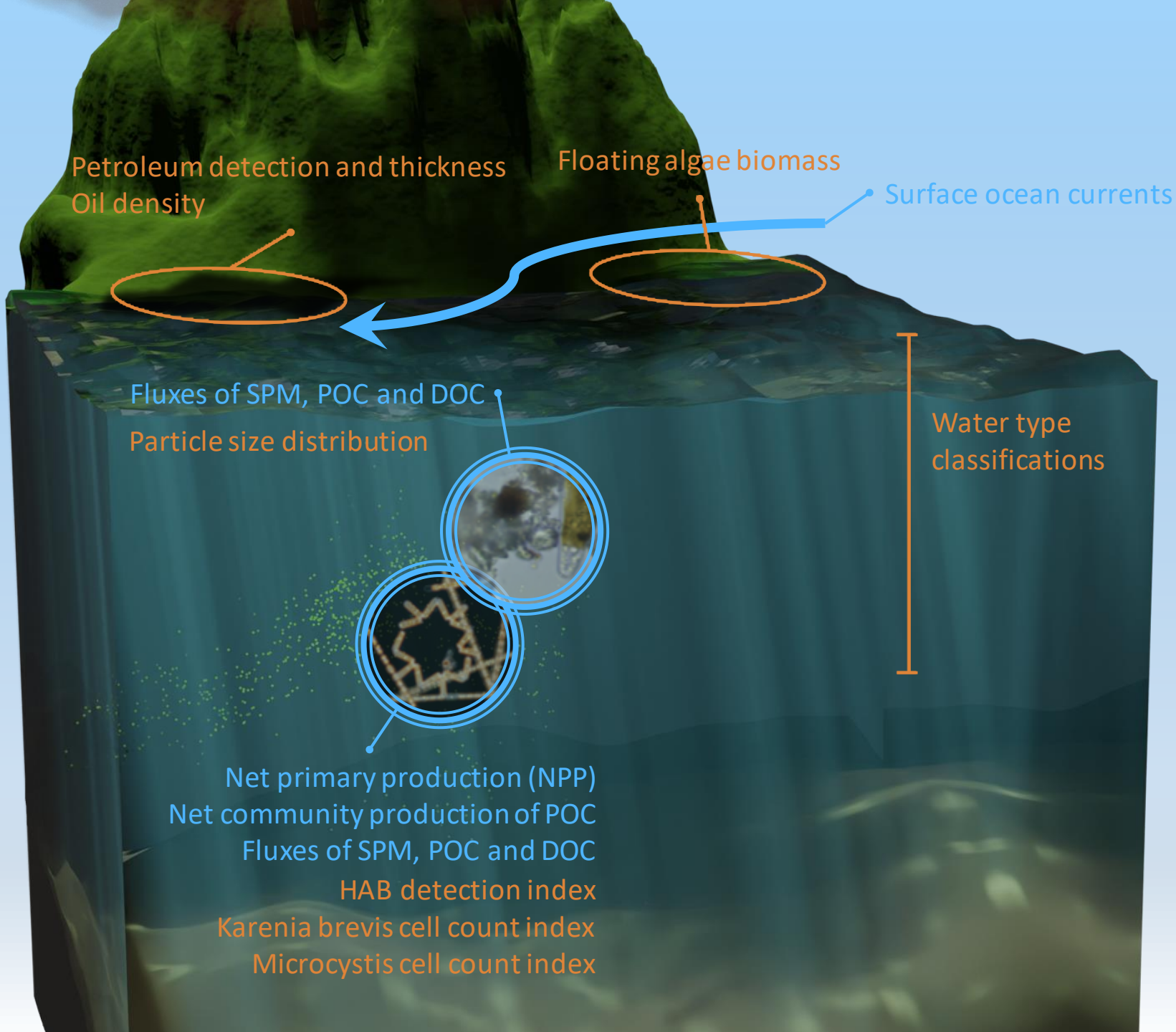


GLIMR
OCEAN COLOR DATA PRODUCTS "TYPICAL" OC PRODUCTS



GLIMR
OCEAN COLOR DATA PRODUCTS
GLIMR RATES AND FLUXES PRODUCTS

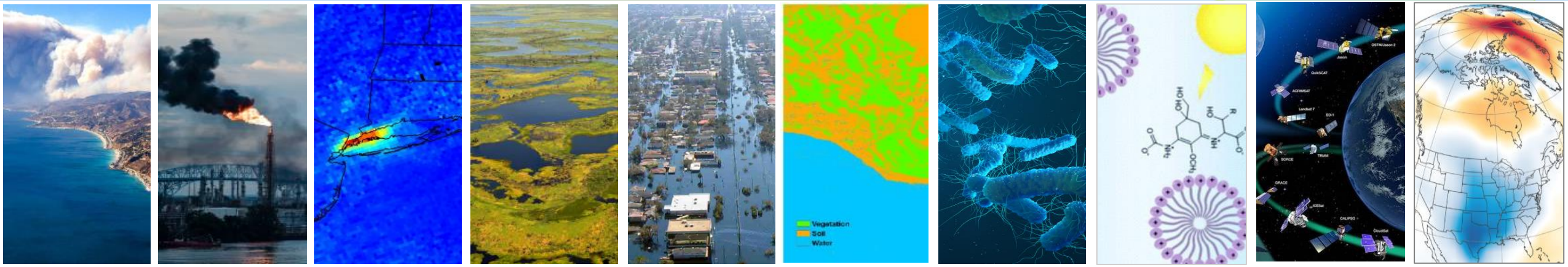
GLIMR APPLICATIONS PRODUCTS



Other multidisciplinary applications & products

- **Land applications/land surface reflectance**
- **NDVI** (normalized difference vegetation index)
- **Wetland** extent/vegetation properties
- **Coastal inundation**
- **Land-ocean biogeochemical exchanges**

- **Synergies/Improve utilization of other sensors**
- Provide **additional model inputs**
- Validate regional **weather/climate models**
- Improve storm surge modeling



- **Nitrogen Dioxide (NO2)**
- **Absorbing aerosols**
- **Air Quality Index** and other atm. applications
- **Air-Sea exchanges**

- **Pathogens** in urban waters
- **Whitening Agents** (human activity)

Update on Project Activities

- Team is preparing for CDR
  - formal NASA review with Standing Review Board (SRB) of experts
- Raytheon completing procurements and building instrument sub-systems
- Team delivering various NASA deliverables (documents & models)
  - Requirements, Concept of Operations (on-orbit), Radiometric calibration, etc.
- UNH developing the Science Operations Center (SOC)
- UNH & A. Kamel developing image navigation & registration algorithms
- GSFC/SDS developing L0-to-L1 and L1-to-L2 code
- GSFC Science performance modeling
- Community outreach & publications
  - Virtual Applications Workshop in Sept 2023
  - Scientific conferences and meetings
- Engaging PACE, TEMPO, GeoXO OCX missions

Thank You